

NASA Facts

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Aerospace Technology Enterprise

The Aerospace Technology Enterprise (AST) mission is to maintain U.S. preeminence in aerospace research and technology. The Enterprise strives to deliver the long-term, high-payoff aerospace technologies that will add value to improve quality of life by strengthening the Nation's economy, improving the environment, increasing our mobility and safety and ensuring continued national security. But NASA's efforts cannot stand alone. We rely on our partners: the Federal Aviation Administration (FAA), U.S. industry, the Department of Defense, and the university community, to help establish requirements, participate in our technology development and implement those technologies in civil and military air and space transportation products. The Enterprise has set the following goals to achieve its mission.

Goal 1) Revolutionize aviation mobility: Enable the safe, environmentally friendly expansion of aviation.

NASA aims to improve global civil aviation by improving passenger safety, throughput, and mobility and by reducing aircraft emissions and noise.

Safety: The projected increase in the number of air travelers will make the need for improved aviation safety more pressing. AST aims to reduce the aircraft accident rate such that, even with air traffic growth, the number of accidents will decline. Strategies to achieve this objective include technologies to identify, understand, and correct aircraft system problems before they lead to accidents; technological interventions to address specific accident causes such as human error and weather; and aircraft modifications to minimize injury in the event of an accident. These efforts will rely on NASA partnerships with the FAA and the aviation community.

Emissions: NASA is committed to helping the aviation community achieve significant reductions in nitrogen oxides and carbon dioxide. Without effective action, carbon dioxide emissions from aviation are projected to increase, with the

potential to accelerate climate change. Similarly, aviation-generated nitrogen oxides are a suspected cause of ground level ozone at airports, a key contributor to air pollution problems in those localities. NASA's goal is to reduce the impact of aviation-related emissions despite the projected increase in aircraft operations. Strategies center on developing more energy-efficient aircraft, engines, and air traffic management tools.

Noise: Aircraft noise is an everyday annoyance to the millions living near airports. Associated noise restrictions constrain the aircraft industry and limit consumer choices. Noise-related concerns limit allowable flight times, inhibit airport construction and expansion, prevent full use of U.S. aerospace products in the world market, and render some aircraft obsolete. Noise is a significant quality of life issue for both airport neighbors and air travelers. NASA's strategies for noise reduction focus on quieter airframes and engines and improved procedures such as glide slopes and flight paths that reduce ground-level noise. The objective is to enable containment of objectionable noise due to aircraft operations to within airport boundaries. NASA will continue working with FAA and industry to accelerate technology development and adoption, for a win-win solution for both aviation and airport neighbor communities.

Passenger Throughput: This objective aims to safely move significantly more passengers through the national air transportation system with fewer delays. Developing new air traffic management technologies and operational procedures that increase efficiency and capacity is one primary focus. The other is new aircraft and airport configurations that make it possible to transport more people without requiring new infrastructure. The first focus will employ better information exchange across the National Airspace System, technologies to eliminate delays due to adverse weather and poor system design, and new concepts for better use of the airspace itself. The second focus will redesign aircraft and airports to enable movement of passengers more quickly and

reliably in all weather conditions. This effort employs close collaboration with the FAA and U.S. air carriers to integrate NASA technologies into systems and operations.

Mobility: NASA aims to improve the mobility of U.S. citizens by reducing travel time for both short and long journeys by air. This requires a wide range of innovations and improvements. For example, NASA is working to integrate small aircraft and all public use landing facilities into the National Air Transportation System, to significantly reduce travel time into and out of all of our Nation's communities. This will require improvements to both aircraft and the network of small airports. For long journeys, affordable supersonic travel will be essential, but the technological challenges are significant. NASA is working to resolve specific technology problems such as sonic booms, engine noise, and emissions, as well as conducting assessments of new vehicle design concepts.

Goal 2) Advance space transportation: Create a safe, affordable highway through the air and into space.

Mission Safety: NASA's objective is to make space travel as safe as today's air travel, moving space travel out of the realm of the extraordinary into the mainstream. Specifically, NASA is working to reduce the risk of crew loss by integrating intelligence into vehicle systems for improved health management and self repair, designing for inherent reliability with fewer parts and more robust subsystems, and using advanced engineering environments to design, test, and verify the entire vehicle system and mission, before the first piece of hardware is cut. Safe space travel will not only help make space accessible to all, but will enhance development of the commercial space sector.

Mission Affordability: NASA aims in ten years to reduce the cost of taking payloads to orbit without compromising safety or reliability through improved reusable launch vehicle concepts and advanced launch systems and launch operations. New propulsion systems, along with improved materials and structures for lightweight and durable in-space transportation vehicles, will open opportunities for near-Earth operations and commercialization. Both affordability and safety are essential if we are to realize a dynamic, productive space market. By developing launch capabilities for both medium/heavy and small payloads, NASA will create a true "Highway to Space."

Mission Time: This objective aims to develop light, fast space propulsion systems and spacecraft to travel to other planets, and breakthrough technologies to allow us to reach other stars within meaningful "human-scale" timeframes.

Goal 3) Pioneer technology innovation: Enable a revolution in aerospace systems.

Engineering Innovation: Assured safety, high mission confidence, fast development times, and efficiency in the development of revolutionary aerospace systems must become the benchmarks of our future engineering processes and culture. To meet those needs, NASA will develop the tools and architecture to provide an intuitive, high-confidence, highly-networked engineering design environment that will unleash the creative power of engineers and technologists, in concert with all mission or product team members. Systems will be designed from atoms into aerospace vehicles, with the ability to accurately understand all key aspects of the system, its operating environment, and its mission before we commit to a single piece of hardware or software.

Technology Innovation: NASA intends to develop and apply cutting edge technologies that will change the definition of what is possible in aeronautics and aerospace. NASA will increasingly look to fields such as biotechnology, information technology, and nanotechnology, for the ability to create new structures by building them at the molecular level, atom by atom, enabling advanced performance attributes such as self-corrective maintenance, system compensation in emergencies, or even capabilities such as changing shape. This "morphing" capability will permit better handling (replacing the current use of flaps), allow a single aircraft to intelligently configure itself to accommodate different missions, and in the event of component failure during flight, to compensate for the failure so the pilot, or an autonomous system, can fly to safety. Space vehicles and long-duration missions can also be enabled by the same technologies. Self-configuring systems, self-repairing skins on a vehicle to "heal" damage from micrometeorites, and intelligent agents that control flight paths or acquisition of scientific data at the spacecraft's destination may become a reality if this objective is realized. The power of combining fundamental "emerging" technologies such as biotechnology, information technology, and nanotechnology cannot be fully imagined nor appreciated at this stage, but it is the Enterprise's intent to aggressively explore new ways to revolutionize the work of NASA.

Goal 4) Commercialization: Extend the benefit of NASA's research and technology.

NASA science and technology can benefit not only the aerospace industry but also numerous other industries such as surface transportation and medicine. It is essential that NASA technology continue to be made available to U.S. industry to augment our economy and benefit the public. To

accomplish this, Enterprise strategies include providing the U.S. aerospace industry with access to NASA facilities and expertise, and proactively establishing partnerships with the private sector and State and local governments. To enable non-traditional applications for NASA technology, the NASA Commercial Technology Network will continue. This effort encompasses organizations throughout the U.S. that are sponsored by, and affiliated with, the NASA Commercial Technology Program. These organizations provide unique expertise and services to U.S. business enterprises and individual citizens, to facilitate and assist the transfer, development, and commercialization of NASA-sponsored technology. The goal is to ensure the widest application of

NASA-developed technology to benefit the Nation. The Aerospace Technology Enterprise is also home to NASA's chief technologist who advises the Administrator and other senior officials on matters relating to technology, assures an Agencywide investment strategy for advanced innovative technology and is the principal Agency advocate for advanced technology. The chief technologist leads the development of Agencywide technology goals and objectives and reviews Agency technology policies, programs, processes, and capabilities to ensure that NASA technology programs support the Agency's science, exploration, and commercial objectives.